

Appl. No. 10/716,894
Atty. Docket No.: 2003B113
Amdt. dated May 15, 2006
Reply to Office Action of February 14, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions and listing of claims in this application.

Listing of Claims:

1. (Currently Amended) A process for producing light olefins, the process comprising the steps of:
 - (a) contacting syngas in the presence of one or more metal-containing catalysts to produce a first feedstock comprising methanol;
 - (b) converting a portion of the methanol in a homologation zone to a second feedstock comprising ethanol by contacting the portion of the methanol with a homologation catalyst selected from the group consisting of potassium oxides, cobalt-molybdenum sulfides, nickel-molybdenum sulfides and potassium carbonates; and
 - (c) introducing the first feedstock and the second feedstock to a process for converting the methanol and the ethanol in the presence of a silicoaluminophosphate molecular sieve catalyst composition to the light olefins, wherein the combined feedstock has a methanol to ethanol weight ratio of from 9.0:1.0 to 19.0:1.0 and the process for converting the methanol and the ethanol to light olefins is carried out at a temperature of at least 475°C.
2. (Original) The process of claim 1, wherein the second feedstock further comprises methanol.
3. (Currently Amended) The process of claim 1, wherein the process further comprises the step of:
 - (d) combining the first feedstock and the second feedstock to form a combined feedstock prior to step (e) converting in the presence of the catalyst.
4. (Original) The process of claim 3, wherein the combined feedstock comprises methanol, ethanol and water.
5. (Currently Amended) The process of claim 4, wherein the process further comprises the step of:

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- (e) removing a weight majority of the water from the combined feedstock prior to step
(e) converting in the presence of the catalyst.

6. (Original) The process of claim 4, wherein the combined feedstock further comprises light ends, the process further comprising the step of:

- (e) removing the light ends from at least a portion of the combined feedstock, wherein the light ends comprise carbon monoxide, methane and hydrogen.

7-8. (Canceled)

9. (Original) The process of claim 1, wherein the molecular sieve catalyst composition comprises a molecular sieve selected from the group consisting of: SAPO-5, SAPO-8, SAPO-11, SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42, SAPO-44, SAPO-47, SAPO-56, AEI/CHA intergrowths, metal containing forms thereof, intergrown forms thereof, and mixtures thereof.

10-11. (Canceled)

12. (Currently Amended) The process of claim [[11]]1, wherein step (b) further comprises contacting the portion of the methanol with the homologation catalyst in the presence of carbon monoxide, optionally hydrogen and optionally carbon dioxide.

13. (Original) The process of claim 12, wherein the process for converting the methanol and the ethanol in the presence of a molecular sieve catalyst composition to the light olefins also produces carbon monoxide, wherein the carbon monoxide is separated from the light olefins and is directed to the homologation zone to provide a carbon monoxide source for step (b).

14. (Original) The process of claim 1, wherein the one or more metal-containing catalysts comprises one or more of copper oxides, zinc oxides and aluminum oxides.

15. (Original) The process of claim 1, wherein the process further comprises the step of:
(d) contacting a natural gas stream with oxygen under conditions effective to convert the natural gas stream into the syngas.

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16. (Currently Amended) An integrated process for producing light olefins, the process comprising the steps of:

- (a) contacting syngas with one or more metal-containing catalysts to produce a first feedstock comprising methanol;
- (b) contacting a portion of the methanol with carbon monoxide in the presence of a catalyst system containing a catalyst selected from the group consisting of potassium oxides, cobalt-molybdenum sulfides, nickel-molybdenum sulfides and potassium carbonates to produce a second feedstock comprising ethanol; and
- (c) ~~introducing~~ combining the first feedstock and the second feedstock ~~to~~ in a process for converting the methanol and the ethanol in the presence of a silicoaluminophosphate molecular sieve catalyst composition to the light olefins, wherein the combined feedstock has a methanol to ethanol weight ratio of from 9.0:1.0 to 19.0:1.0 and the process for converting the methanol and the ethanol to light olefins is carried out at a temperature of at least 475°C.

17. (Original) The integrated process of claim 16, wherein the second feedstock further comprises methanol.

18. (Currently Amended) The integrated process of claim 16, wherein the process further comprises the step of:

- (d) combining the first feedstock and the second feedstock to form a combined feedstock prior to ~~step (e)~~ converting in the presence of the catalyst.

19. (Original) The integrated process of claim 18, wherein the combined feedstock comprises methanol, ethanol and water.

20. (Currently Amended) The integrated process of claim 19, wherein the process further comprises the step of:

- (e) removing a weight majority of the water from the combined feedstock prior to ~~step~~ (e) converting in the presence of the catalyst.

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21. (Original) The integrated process of claim 19, wherein the combined feedstock further comprises light ends, the process further comprising the step of:

- (e) removing the light ends from at least a portion of the combined feedstock, wherein the light ends comprise carbon monoxide, methane and hydrogen.

22-23. (Canceled)

24. (Original) The integrated process of claim 16, wherein the molecular sieve catalyst composition comprises a molecular sieve selected from the group consisting of: SAPO-5, SAPO-8, SAPO-11, SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42, SAPO-44, SAPO-47, SAPO-56, AEI/CHA intergrowths, metal containing forms thereof, intergrown forms thereof, and mixtures thereof.

25-26. (Canceled)

27. (Original) The integrated process of claim 16, wherein the one or more metal-containing catalysts comprises one or more of copper oxides, zinc oxides and aluminum oxides.

28. (Original) The integrated process of claim 16, wherein the process further comprises the step of:

- (d) contacting a natural gas stream with oxygen under conditions effective to convert the natural gas stream into the syngas.

29. (Currently Amended) A process for producing light olefins, the process comprising the steps of:

- (a) contacting a syngas stream with a methanol synthesis catalyst under first conditions effective to form a methanol-containing stream comprising methanol;
- (b) contacting at least a portion of the methanol-containing stream with carbon monoxide and a homologation catalyst selected from the group consisting of potassium oxides, cobalt-molybdenum sulfides, nickel-molybdenum sulfides and potassium carbonates ~~under second conditions effective to form~~ and forming a mixed alcohol stream

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comprising methanol and ethanol at a methanol to ethanol weight ratio of from 9.0:1.0 to 19.0:1.0; and

(c) contacting at least a portion of the mixed alcohol stream with a silicoaluminophosphate molecular sieve catalyst composition ~~under third conditions effective at a temperature of at least 475°C~~ to convert the methanol and the ethanol to the light olefins.

30. (Original) The process of claim 29, wherein the mixed alcohol stream further comprises water, the process further comprising the step of:

(d) separating a weight majority of the water from the mixed alcohol stream.

31. (Original) The process of claim 29, wherein the molecular sieve catalyst composition comprises a molecular sieve selected from the group consisting of: SAPO-5, SAPO-8, SAPO-11, SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42, SAPO-44, SAPO-47, SAPO-56, AEI/CHA intergrowths, metal containing forms thereof, intergrown forms thereof, and mixtures thereof.

32-36. (Canceled)

37. (Original) The process of claim 29, wherein the methanol synthesis catalyst is selected from the group consisting of: copper oxides, zinc oxides and aluminum oxides.

38. (Original) The process of claim 29, wherein the mixed alcohol stream further comprises light ends, the process further comprising the step of:

(d) removing the light ends from at least a portion of the mixed alcohol stream, wherein the light ends comprise carbon monoxide, methane and hydrogen.

39. (Original) The process of claim 29, wherein the process further comprises the step of:

(d) separating the mixed alcohol stream into a first fraction and a second fraction, wherein the first fraction comprises a weight majority of the methanol present in the mixed alcohol stream, and wherein the second fraction comprises a weight majority of the ethanol present in the mixed alcohol stream.

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40. (Original) The process of claim 29, wherein the process further comprises the step of:

- (d) contacting a natural gas stream with oxygen under conditions effective to convert the natural gas stream into the syngas stream.

41-57. (Canceled)

58. (Currently Amended) A process for producing light olefins, wherein the process comprises the steps of:

- (a) contacting a syngas stream comprising carbon monoxide, hydrogen and optionally carbon dioxide with a methanol synthesis catalyst under first conditions effective to form a methanol-containing stream comprising methanol and water;
- (b) contacting at least a portion of the methanol-containing stream with carbon monoxide, ~~optionally hydrogen~~ and a homologation catalyst selected from the group consisting of potassium oxides, cobalt-molybdenum sulfides, nickel-molybdenum sulfides and potassium carbonates under second conditions effective to form and forming a mixed alcohol stream comprising methanol, ~~ethanol and water~~ and ethanol at a methanol to ethanol weight ratio of from 9.0:1.0 to 19.0:1.0;
- (c) contacting at least a portion of the mixed alcohol stream with a silicoaluminophosphate molecular sieve catalyst composition in a reaction system ~~under third conditions effective~~ at a temperature of at least 475°C to convert the methanol and ethanol to light olefins;
- (d) yielding an effluent stream from the reaction system, wherein the effluent stream has an ethylene to propylene weight ratio of about from about 0.9:1.0 to about 2.2:1.0.

59. (Original) The process of claim 58, wherein the ethylene to propylene weight ratio is from about 1.1:1.0 to about 1.4:1.0.

60. (Original) The process of claim 58, wherein the process further comprises the step of:

- (e) removing a weight majority of the water from the mixed alcohol stream.

61. (Original) The process of claim 58, wherein the molecular sieve catalyst composition comprises a molecular sieve selected from the group consisting of: SAPO-5, SAPO-8, SAPO-11,

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SAPO-16, SAPO-17, SAPO-18, SAPO-20, SAPO-31, SAPO-34, SAPO-35, SAPO-36, SAPO-37, SAPO-40, SAPO-41, SAPO-42, SAPO-44, SAPO-47, SAPO-56, AEI/CHA intergrowths, metal containing forms thereof, intergrown forms thereof, and mixtures thereof.

62-66. (Canceled)

67. (Original) The process of claim 58, wherein the methanol synthesis catalyst is selected from the group consisting of: copper oxides, zinc oxides and aluminum oxides.

68. (Original) The process of claim 58, wherein the process further comprises the step of:
(e) removing light ends from at least a portion of the mixed alcohol stream, wherein the light ends comprise carbon monoxide and hydrogen.

69. (Original) The process of claim 58, wherein the process further comprises the step of:
(e) contacting a natural gas stream with oxygen under conditions effective to convert the natural gas stream into the syngas stream.

70-81. (Canceled)